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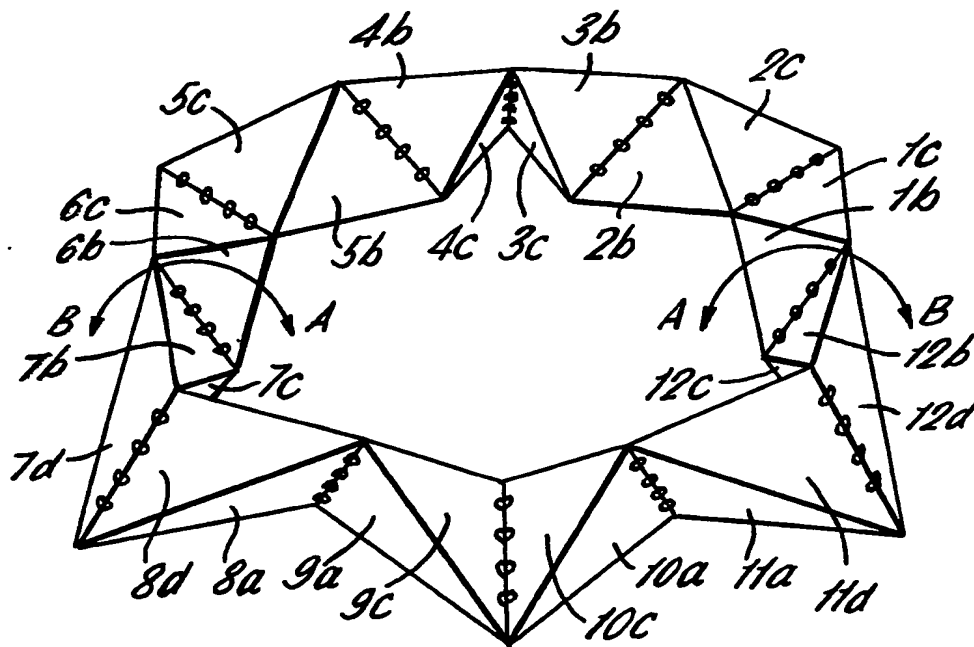
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#### (54) Polytetrahedral chain device

(57) The device comprises twelve tetrahedral segments (1 to 12) hinged edge-to-edge in a ring, alternate pairs of segments (2, 3, 6, 7, 10, 11) being identical in shape, the remaining segments (1, 4, 5, 8, 9, 12) being mirror images. The segments may be formed from sheet blanks which comprise interlocking tongues. A plastics web extends through the string of segments to form the hinges.

The device may be used as a plaything, or carry advertisements, a calender or other information or be used as a packaging device if the segments are truncated so that a cavity is formed in the centre of the device when arranged as a cube.

FIG. 9.



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FIG. 1.

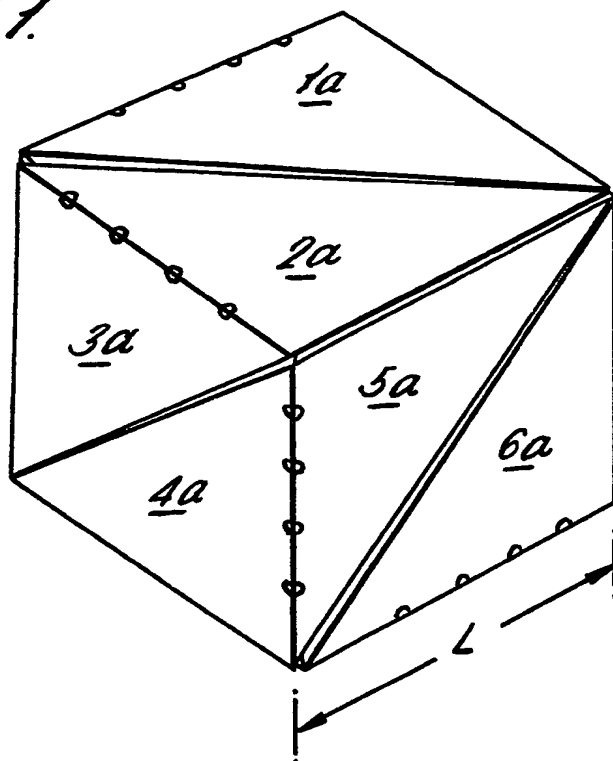
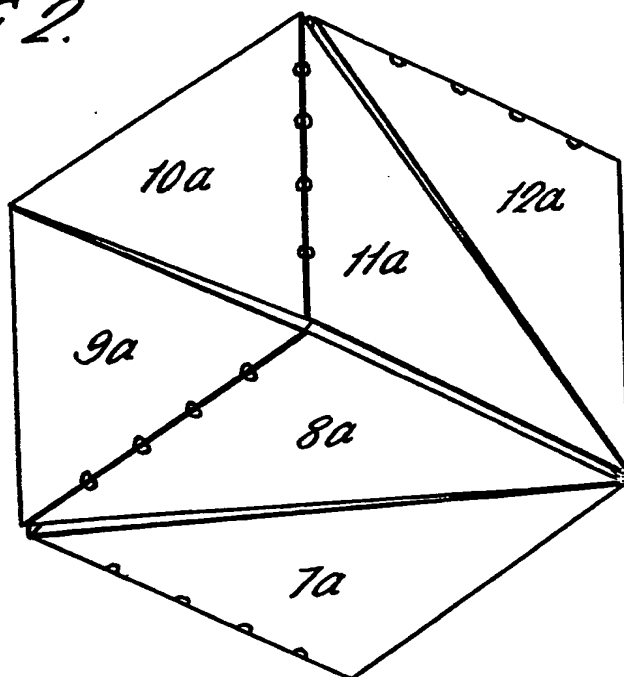


FIG. 2.



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FIG. 3.

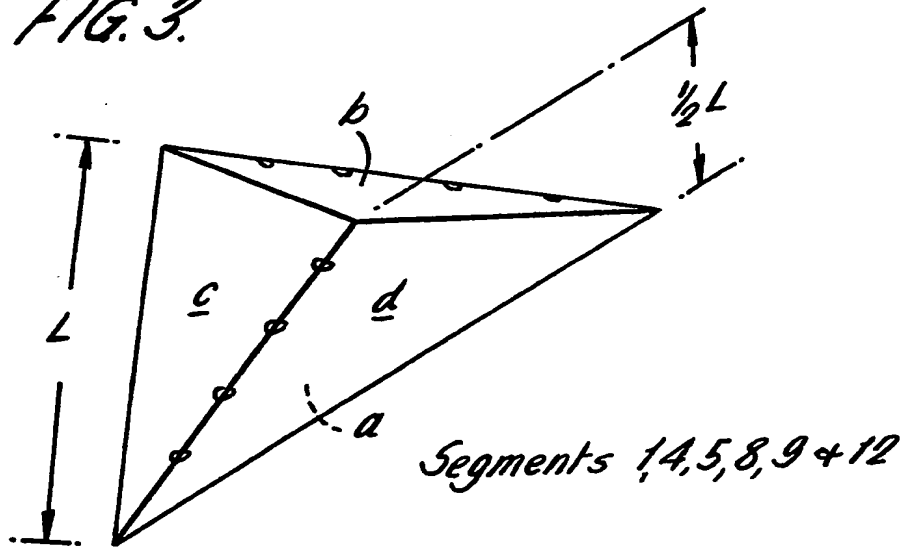
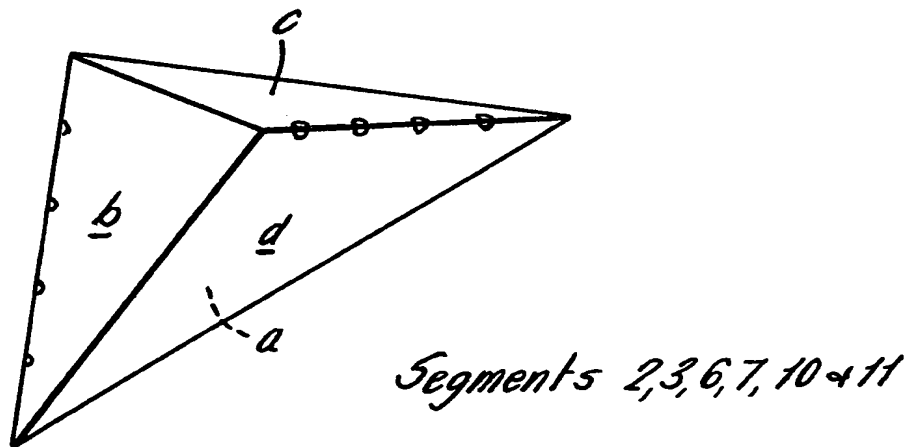


FIG. 4.



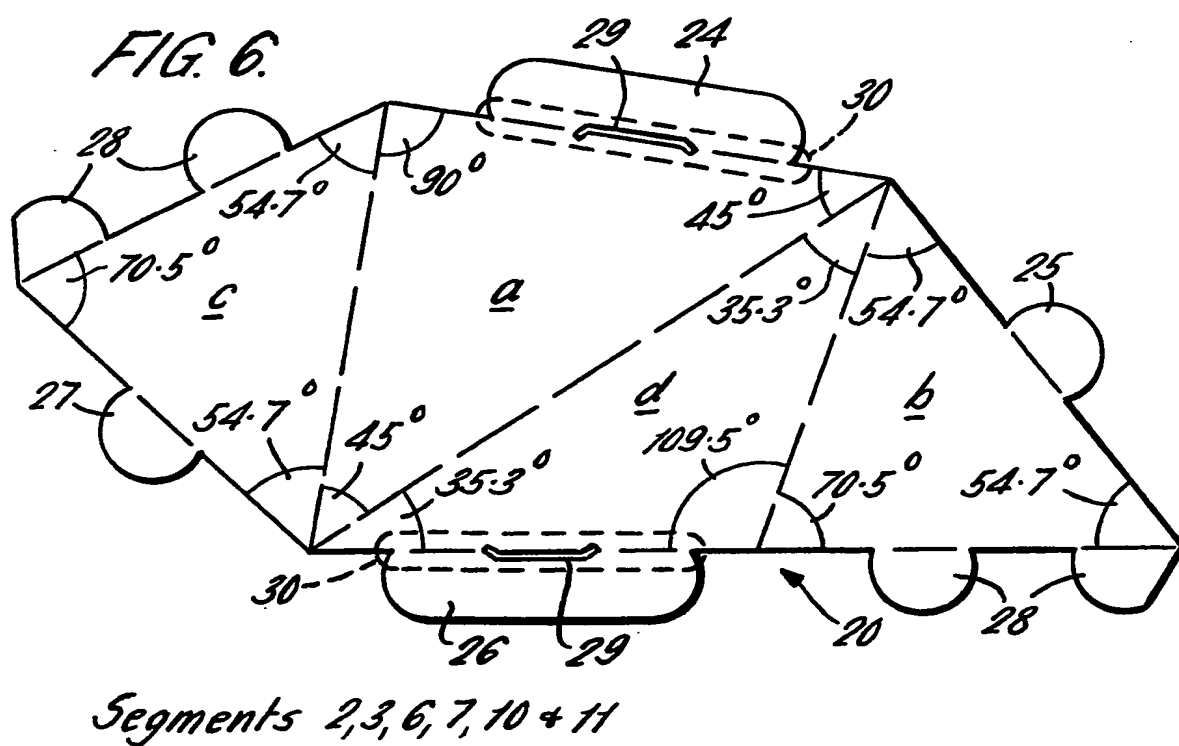
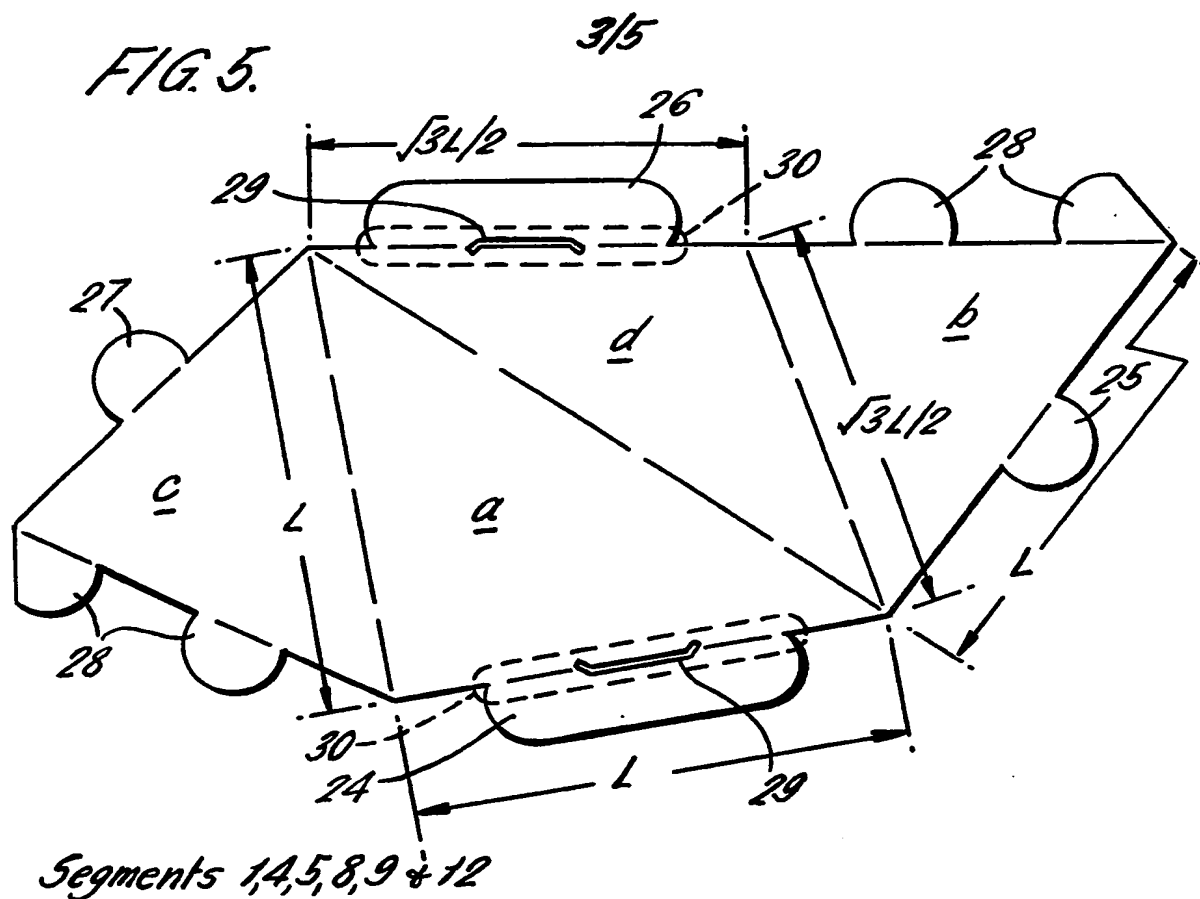
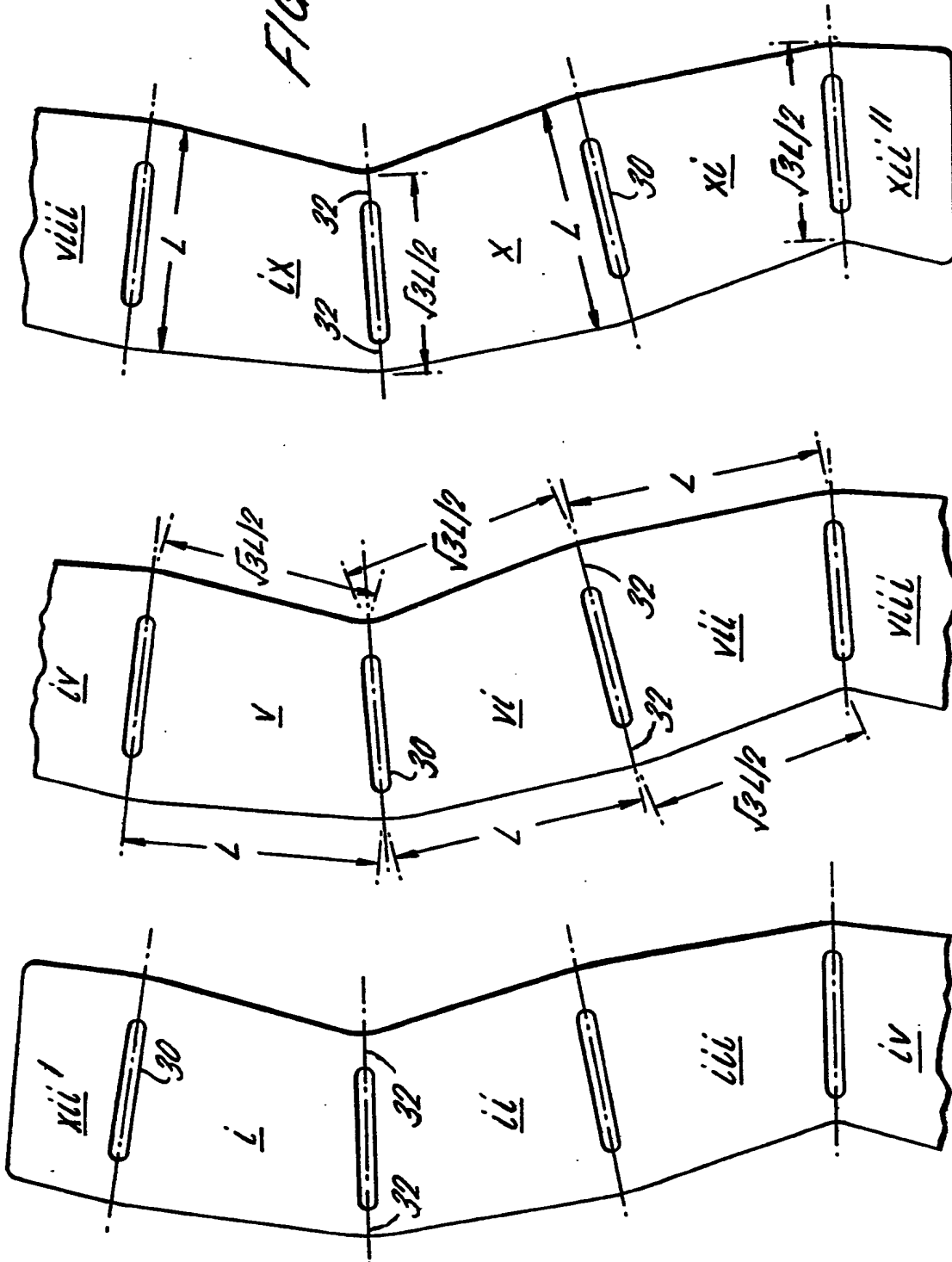


FIG. 7.



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FIG. 8.

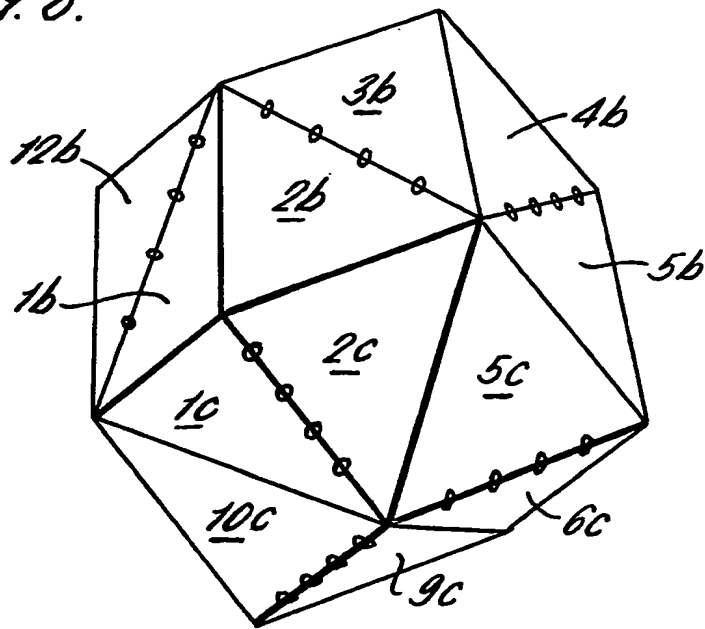
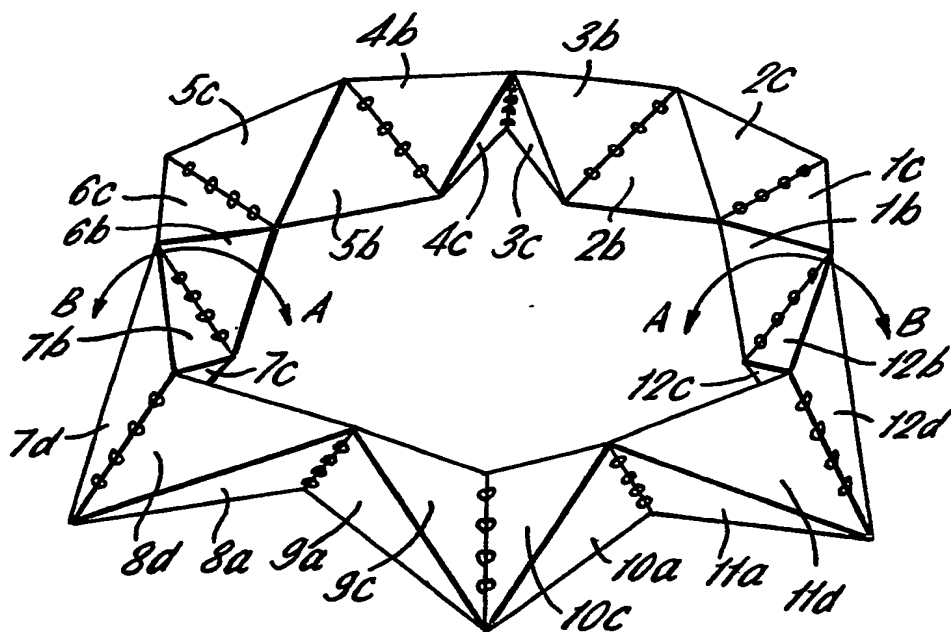


FIG. 9.



## SPECIFICATION

## Multi-shapeable devices

This group of invention relates to multi-shapeable devices.

According to one of the present group of inventions, there is provided a multi-shapeable device comprising a string of hinged pairs of tetrahedral or frusto-tetrahedral segments, the segments being so hinged and shaped that they can be manipulated to a position in which they form a compact body in which the segments are nestled together and in which the segments in each pair each have a face which faces together form a face of the compact body, the device being capable of being opened into a ring form which can be manipulated to other positions and which can be rotated through itself.

Such a device may be used as a plaything, and/or may carry advertisements or a calendar and other information.

In the preferred form of the device according to said one invention, twelve such segments are provided hinged edge-to-edge one to another in a ring, the compact body which can be formed by the device being a cuboid with one face of each segment forming a diagonal half of one of the faces of the cuboid with the other three faces of each segment extending from said one face towards the centre of the cuboid, one of the hinge edges of each segment lying along the intersection of two faces of that segment and the other hinge edge of each segment lying along the intersection of the other two faces of that segment.

According to another of the present group of inventions there is provided a multi-shapeable device comprising a web of flexible material and a multiplicity of hollow segments formed around the web so that by means of the web the segments are hinged edge-to-edge one to another in a ring or a string.

A specific embodiment of both inventions will now be described by way of example, reference being made to the accompanying drawings, in which:

Figure 1 is a perspective view of a device according to the present invention in the compact position;

Figure 2 is a perspective view of the device shown in Figure 1 viewed in the opposite direction, i.e. from behind relative to Figure 1;

Figures 3 and 4 are perspective views of two types of segment in the device shown in Figures 1 and 2;

Figures 5 and 6 illustrate blanks for forming the two types of segments shown in Figures 3 and 4;

Figure 7 illustrates a web for forming the hinges in the devices shown in Figures 1 and 2; and

Figures 8 and 9 are perspective views of other positions of the device, as shown on a reduced scale.

Referring to the drawings, a device according to the present invention comprises twelve tetrahedral

segments 1 to 12 hinged edge-to-edge one to another in the order 1 to 2, 2 to 3, 3 to 4, —, 11 to 12 and 12 to 1, so as to form a ring. Each segment has a base face *a* which is an isosceles right-angle triangle having sides of length *L*, *L* and  $\sqrt{2}L$ , a further face *d* which is an isosceles triangle and extends perpendicularly from the hypotenuse of the base face *a* to a height of  $\frac{1}{2}L$  from the base face *a* and two other faces *b*, *c* which are isosceles triangles and have a similar shape to each other.

As can be seen from Figures 3 and 4, the segments 1, 4, 5, 8, 9 and 12 are identical in shape to the segments 2, 3, 6, 7, 10 and 11, but the faces *b*, *c* are reversed.

For each segment, one hinge edge *ab* lies along the intersection of the base face *a* and one of the other faces *b*, and the other hinge edge *cd* lies along the intersection of the further face *d* and the remaining face *c*. The hinge edges are arranged in the following manner. Hinge edge 1*cd* of segment 1 is hinged to hinge edge 2*cd* of segment 2 so that face 1*c* can lie against face 2*c* and so that face 1*d* can lie against face 2*d*; hinge edge 2*ab* is hinged to hinge edge 3*ab*; hinge edge 3*cd* is hinged to hinge edge 4*cd*; and so on until the last hinge which completes the ring and which is formed by hinging hinge edge 12*ab* to hinge edge 1*ab*.

The hinge edges are indicated in the drawings by circled lines.

Each of the segments 1, 4, 5, 8, 9 and 12 is formed from a blank 20 of sheet card as shown in Figure 5, and the segments 2, 3, 6, 7, 10 and 11 from blanks 22 as shown in Figure 6. The blanks 20, 22 are scored as indicated by dashed lines and the portions *b*, *c*, *d* are folded down relative to portion *a* to form the segment. Tabs 24 to 28 are provided which interlock or may be glued to complete the segment.

The tabs 24, 26 provided on the portions *a*, *d* respectively are longer than the remaining tabs, and are provided with narrow slots 29 to receive the tabs 25, 27 respectively. The tabs 24, 26 are shorter than the lengths of the edges on which they are provided so that a narrow slit remains on either side of the tabs 24, 26 after the blanks 20, 22 has been formed into a segment.

The segments are hinged together by means of a web of flexible material, such as polyethylene, as shown in Figure 7. Each section *i* to *xi* of the web extends through a respective one of the segments 1 to 11, and the two end sections *xii'*, *xii''* extends into the segment 12. Between each section of the web a slot 30 extends part-way across the web, and the pairs of portions 32 on either side of the slots form the hinges between the segments.

As each segment is formed from its blank, it is folded around the respective segment of the web, and the tabs 24, 26 of the blank are passed through the slots 30 on either side of the section of the web to lock the segment to the web, the hinge portions 32 extending through the slits in the segment on either side of the tabs 24, 26. Thus, each slot 30 receives two tabs 24 or 26, one from each of two adjacent

The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

This print embodies corrections made under Section 117(1) of the Patents Act 1977.

s gments.

Once constructed, the device can be manipulated to the "compact" position shown in Figures 1 and 2 in which the segments 1 to 12 nestle together to form a cube. From the compact position, the device can be manipulated to many other positions. For example, in Figure 8 there is illustrated a position in which the segments form six right square-based pyramids arranged around a cubic cavity (having a length of side of  $L$ ) to form a polyhedron having twelve rhombic faces (having a length of side of  $\sqrt{3}L/2$ ), each rhombic face being formed by two faces  $b$  or two faces  $c$  of a pair of segments.

In the position shown in Figure 9, the device has been opened out to form an open ring. The relative positions of many of the segment faces can be seen from Figure 9. In this ring form, the device can be manipulated so that it rotates through itself in the directions shown by the arrows A and B.

The device may be modified. For example, in accordance with the second invention, a flexible web may be used with other multi-shapeable devices to hinge a multiplicity of segments edge-to-edge one to another in a ring. For example, such a web may be used to hinge together the segments of the devices disclosed in United Kingdom Patent Application No. 2074459. Also, the web may be similarly used to hinge segments together in a string rather than in a ring.

Furthermore, the segments may be truncated by removing the apex of each segment formed by the intersection of the faces  $b$ ,  $c$  and  $d$ , and thus when the device is placed in the compact position a cavity will be formed in the centre of the cube. In this way, the device may be used as a container or packaging device.

#### CLAIMS

1. A multi-shapeable device comprising a string of hinged pairs of tetrahedral or frusto-tetrahedral segments, the segments being so hinged and shaped that they can be manipulated to a position in which they form a compact body in which the segments are nestled together and in which the segments in each pair each have a face which faces together form a face of the compact body, the device being capable of being opened into a ring form which can be manipulated to other positions and which can be rotated through itself.

2. A device as claimed in claim 1, wherein twelve such segments are provided hinged edge-to-edge one to another in a ring, the compact body which can be formed by the device being a cuboid with one face of each segment forming a diagonal half of one of the faces of the cuboid with the other three faces of each segment extending from said one face towards the centre of the cuboid, one of the hinge edges of each segment lying along the intersection of two faces of that segment and the other hinge edge of each segment lying along the intersection of the other two faces of that segment.

3. A device as claimed in claim 2, wherein in the position in which the device forms a compact body, one of the hinge edges of each segment lies along a respective edge of the cuboid.

4. A device as claimed in claim 2 or 3 wherein

said one face of each segment has the shape of an isosceles right-angled triangle, so that the compact body formed by the device is a cube.

5. A device as claimed in claim 4, wherein each segment is formed from a blank of sheet material which is folded to form the segment.

6. A device as claimed in claim 5, wherein the shape of each blank for every alternate pair of segments is substantially as shown in Figure 5 of the accompanying drawings and the shape of the blanks for the remaining segments is substantially as shown in Figure 6 of the accompanying drawings.

7. A device as claimed in any preceding claim, including a web of flexible material, the segments being formed around the web so that the segments are hinged to one another by means of the web.

8. A multi-shapeable device comprising a web of flexible material and a multiplicity of hollow segments formed around the web so that by means of the web the segments are hinged edge-to-edge one to another in a ring or a string.

9. A device as claimed in claim 7 or 8, wherein, at each hinge between adjacent segments, the web is formed with an elongate slot extending generally along the hinge axis and each of those two adjacent segments has a portion extending through the slot at the hinge edge of the segment to lock the segment to the web at the hinge edge.

10. A device as claimed in claim 9, wherein the shape of the web is substantially as shown in Figure 7 of the accompanying drawings.

11. A multi-shapeable device substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

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